

University of Asia Pacific
Department of Civil Engineering
Mid Semester Examination Spring 2018
Program: B.Sc. Engineering (Civil)

Course Title: Engineering Materials
Time: 1 hour

Course Code: CE 201
Full Marks: 60 (35+10+15)

Answer all questions

1. The demand of High Performance Concrete (HPC) is increasing drastically due to its high workability, high density with superior mechanical properties as well as better durability than normal concrete. Given the many benefits of HPC in fresh as well as in the hardened state, it is essential to know the fire resistance behavior of this concrete. Within this context, a concrete wall with a nominal dimension of 3.0 m X 1.2 m X 0.2 m will be heated on one side over the full length and height of the wall to determine the fire resistance behavior of the HPC wall. To ensure the high strength, the aggregates are collected for the HPC and performed specific gravity, unit weight, void, and sieve analysis at CE-UAP. The test data are given below:

ASTM Sieve	Sieve opening (mm)	Materials Retained (gm)	
		Sand-X	Sand-Y
3 inch	76.20	0	0
1.5 inch	38.10	0	0
3/4 inch	19.05	0	0
3/8 inch	9.50	0	0
# 4	4.75	0	0
# 8	2.36	0	0
# 12	1.70	80	0
# 16	1.19	80	50
# 30	0.59	50	200
# 40	0.425	70	200
# 50	0.30	45	0
# 100	0.15	25	0
# 200	0.075	100	0
Pan	-	0	0

a).

[20]

- (i) Calculate Fineness Modulus (FM) of the fine aggregate (sand) samples.
(ii) Draw the grading curve of the fine aggregate samples and make comments on the grading curve

- b). [15]
- Plastering of the wall is necessary to provide extra protection from the environmental actions at all seasons such as sand blown by the wind, washing of acid rain, exposure to blazing sunlight, and carbonization and so on. To this aim, 5 mm thick mortar will be applied to the exterior surface of the wall (3 m x 1.2 m).
- Assume sand to cement ratio (weight basis) = 3, water to cement ratio = 0.50, air content = 2%, specific gravity of fine sand = 2.6, and cement type = OPC.
- (i) Estimate the amount of each ingredient (cement, sand, and water) of mortar necessary for the plastering work of the exterior surface of the wall. Assume 10% extra volume of material is necessary due to total loss of mortar during application on the wall surface.
- (ii) What adjustment in sand volume is necessary, if the bulking of sand is 30%?
[Unit weight of sand (with void) = 1500 kg/m³]
2. (a) Using schematic diagram, make the comparison between ductility and brittleness of the materials. [2]
- Or
- Based on your knowledge what is the difference between initial tangent modulus and secant modulus of the materials.
- (b) Define the following mechanical properties of a material: Shear strain and Poisson's ratio. [4]
- (c) Draw qualitative stress-strain curves of concrete, mild steel, glass, and rubber. [4]
3. (a) "Brick gets strength during burning", Do you agree or disagree with this statement? Justify your answer. [2]
- Or
- "Drying of brick at ambient temperature before burning is very important", Do you agree or disagree with this statement? Give your opinion. [2]
- (b) Illustrate the function of frog mark of brick. [2]
- (c) Apply the knowledge to explain the causes of efflorescence of brick and how to remove it? [3]
- (d) "Cement making industry significantly increases the CO₂ in the air, resulting in big negative environmental impacts and then raise the risk of human life", Do you agree with this statement? Based on your knowledge, what is your proposal to reduce the emission of CO₂ from cement making industry? [2]
- (e) Draw the development of strength of pure compounds of cement: C₂S, C₃S, C₃A, and C₄AF. Explain hydration of Silicate with chemical reaction. Which is the main strength giving compound and what is the shape and size of that compound? [4]
- (f) Based on your knowledge, what is flash setting of cement and how to control it? [2]
- Or
- Explain the factors that effects the normal consistency of a cement.

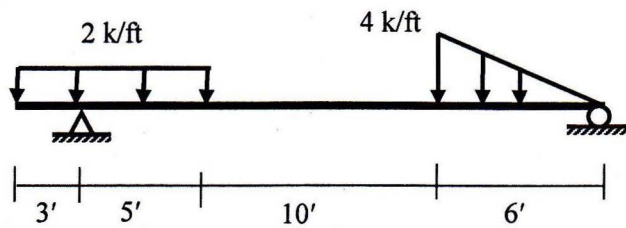
University of Asia Pacific
Department of Civil Engineering
Mid Term Examination Spring 2018
Program: B.Sc. in Civil Engineering

Course Title: Mechanics of Solids I
 Time: 1:00 hour

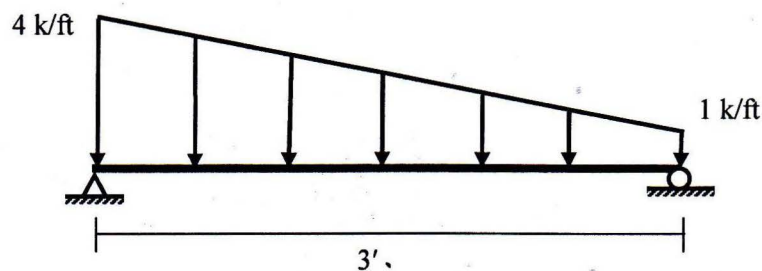
Course Code: CE 211
 Full Marks: $3 \times 10 = 30$

Answer any 3 (Three) of the following 4 (Four) Questions
The symbols have their usual meanings.
[Assume reasonable values for any missing data]

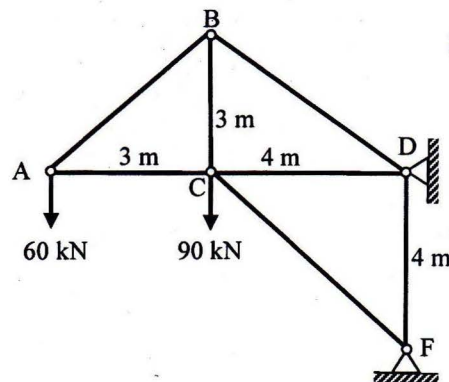
1. Draw shear force and bending moment diagrams for the following beam.



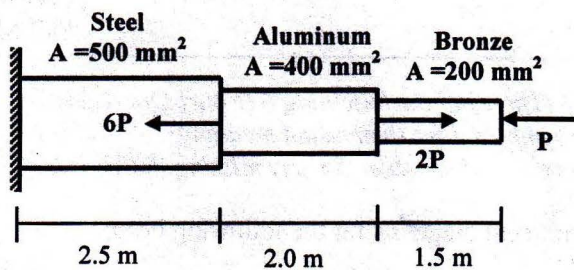
2. Derive the equations of shear force and bending moment for the following beam.



3. Calculate the stresses indicating the tension or compression in members BC, BD and CF for the truss shown in the following figure. The cross-sectional area of each member is 1600 mm^2 .



4. An aluminum rod is rigidly attached between a steel rod and a bronze rod as shown in the following Figure. Axial loads are applied at the positions indicated. Determine the maximum value of P that will not exceed maximum allowable stress in any of the materials. Given that, maximum allowable stress in steel, aluminum and bronze are 140 MPa, 90 MPa and 100 MPa respectively.

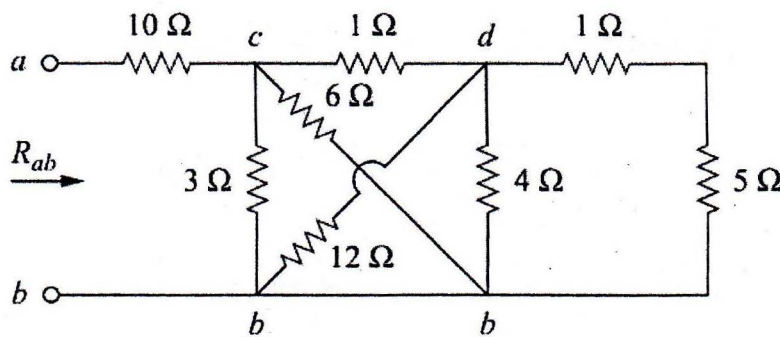


University of Asia Pacific
Department of Civil Engineering
Mid Semester Examination, Spring-2018
Program: B. Sc Engineering (2nd Year / 1st Semester)

Course Title: Basic Electrical Engineering Course No. ECE(CE) 201 Credits: 3.00
 Time: 1.00 Hour Full Marks: 60

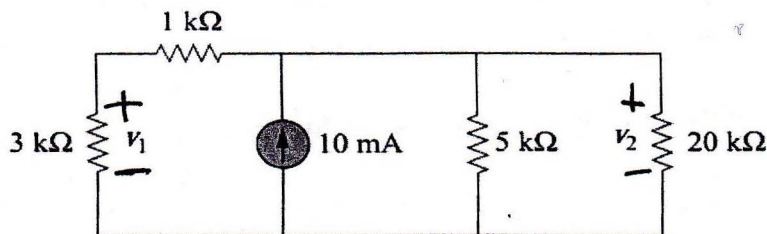
There are **Four** Questions. Answer any **Three**. Figures in the right margin indicate marks.

1. (a) Calculate the equivalent resistance R_{ab} at terminals a-b. 10



Circuit diagram for question 1(a)

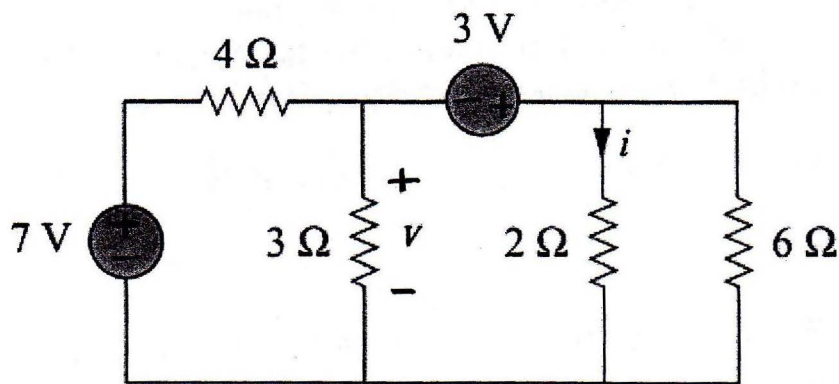
- (b) For the following circuit, find: (a) v_1 and v_2 , (b) the power dissipated in the 3-k and 20-k resistors, and (c) the power supplied by the current source. 10



Circuit diagram for question 1(b)

2. (a) Find v and i in the following circuit using nodal analysis.

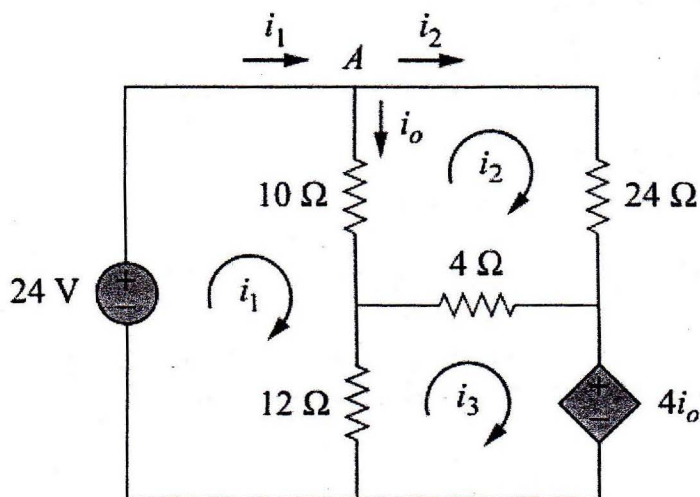
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Circuit diagram for question 2(a)

(b) For the following circuit, find i_o using mesh analysis.

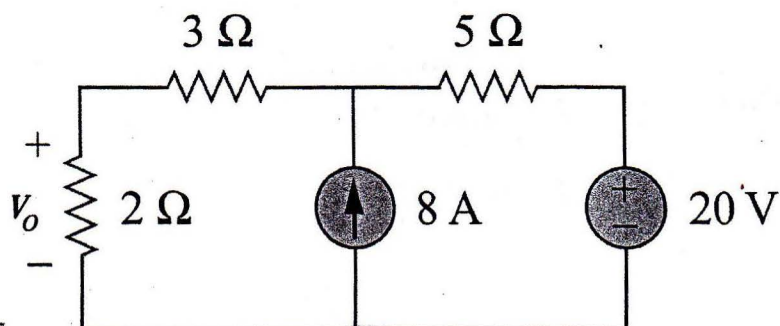
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Circuit diagram for question 2(b)

3. (a) Use the Superposition theorem to find V_o in the following circuit.

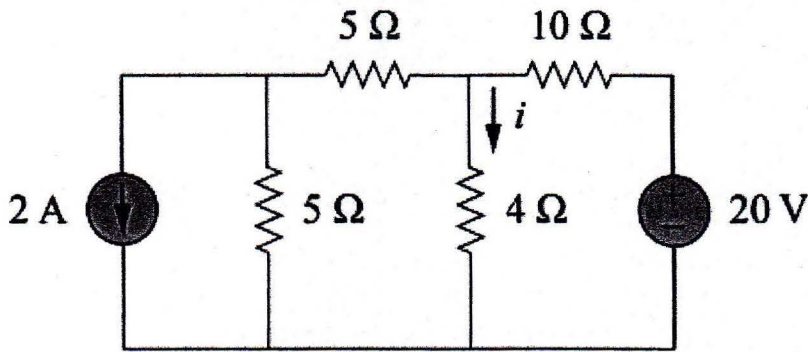
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Circuit diagram for question 3(a)

(b) Use Source Transformation to find i in the following circuit.

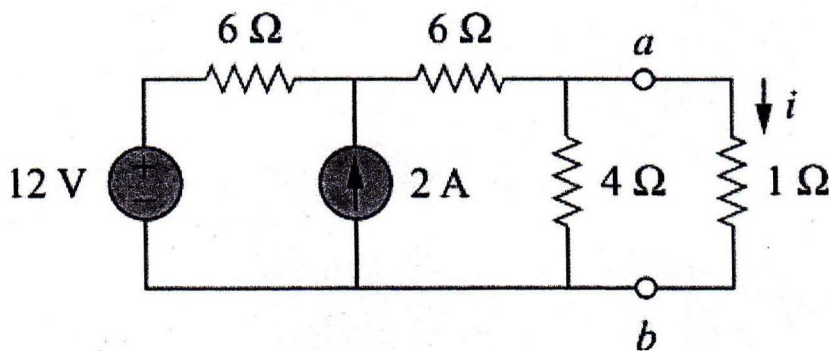
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Circuit diagram for question 3(b)

4. (a) Using Thevenin's theorem, find the equivalent circuit to the left of the terminals a-b of the following circuit. Then find i .

10



Circuit diagram for question 4(a)

(b) Write short note on the following topics

4*2.5

- i. KVL
- ii. Thevenin's Theorem
- iii. Superposition Theorem
- iv. Ohm's law

University of Asia Pacific
Department of Basic Sciences and Humanities
Mid Semester Examination, Spring 2018
Programme: B. Sc. Engineering (Civil)
(2nd year 1st Semester)

Course Title: Bangladesh Studies: Society and Culture
Credit: 2.00

Course Code: HSS 211(a)

Time: 1 Hour

Full Marks: 40

Answer ANY FOUR (4x10)

1. Define Sociology. Find and explain the connection between Sociology and Civil Engineering. 10
2. Discuss G. Lenski's different types of society with examples. 10
3. Define Culture. State different elements of culture in relation to your own society. 10
4. Define institution. Distinguish between association and institution. 10
5. Write short notes: 10
 - a. Cultural lag.
 - b. Feudalism and capitalism.

University of Asia Pacific
Department of Basic Sciences and Humanities
Mid Semester Examination, Spring 2018
Program: B.Sc. Engineering (Civil)
2nd year 1st semester

Course Title: Bangladesh Studies: History Course Code: HSS 211(b)

Credit: 2.00

Total Time: 1 Hour

Full Marks: 40

There are **Five** Questions. Answer any **Four**. All questions are of equal value. Figures in the right margin indicate marks.

1. a. Give an account of the growth of Sasanka as an independent ruler. 5
b. Point out the achievements of Sasanka. 5
2. a. Write about the military expansion of the Palas. 5
b. Describe the achievements of the Palas. 5
3. a. Note down the causes of the victory of Bakhtiar Khalji over the Sena ruler. 5
b. Give reasons for so many occurrences of rebellions in Bengal during early Muslim rule. 5
4. a. Name the first Muslim dynasty and its founder. 2
b. Write the way Raja Ganesh successfully kept his family in power. 3
c. Note down the achievements of the two independent Muslim dynasties in Bengal. 5
5. a. Discuss the trade and commerce in Mughal Bengal. 5
b. Explain how Murshid Quli Khan revolutionized the revenue system of Bengal. 5

University of Asia Pacific
Department of Basic Sciences & Humanities
Mid Examination, Spring-2018
Program: B.Sc. in Civil Engineering

Course Title: Mathematics III
Time: 1.00 Hour

Course Code: MTH 201

Credit: 3.00
Full Marks: 60

There are **Four** Questions. Answer any **Three**. All questions are of equal value. Figures in the right margin indicate marks.

- 1.(a) Find the values of a, b and c such that the curve $y = ax^2 + bx + c$ passes through the points $(1,6)$, $(-2, -6)$ and $(3, 4)$. 15

- (b) Consider the matrices 5

$$A = \begin{pmatrix} 1 & -3 & 2 \\ 4 & 1 & -1 \\ -3 & 2 & 5 \end{pmatrix} \text{ and } B = \begin{pmatrix} 1 & -3 & 2 \\ 4 & 1 & -1 \\ 9 & -13 & -4 \end{pmatrix}.$$

Find the elementary matrices E_1 such that $E_1 A = B$.

- 2.(a) Find $\text{adj}(A)$ and $\det(A)$ by the cofactor expansion of the second row for the following matrix 15

$$A = \begin{pmatrix} 2 & 1 & -1 \\ 0 & 2 & 1 \\ 5 & 2 & -3 \end{pmatrix}.$$

Does A^{-1} exist? If exists, find A^{-1} .

- (b) Let A and B be two 3×3 matrices such that $|A| = 3$ and $|B| = -1$. Find $|-3A|$, $|2B^{-1}A|$, $|A^2B^2|$ and $|A^{-1}B^{-1}A^T|$, $|A^{-1} + \text{adj}(A)|$. 5

- 3.(a) Determine whether the following vectors in \mathbb{R}^3 are linearly dependent or independent: 15
 $v_1 = (1, -2, 3)$, $v_2 = (5, 6, -1)$ and $v_3 = (3, 2, 1)$.
If dependent, write one vector as a linear combination of the others.

- (b) Write down the standard bases of \mathbb{R}^3 and $M_{2 \times 2}$. 5

4. Let $A = \begin{pmatrix} 1 & 4 \\ 2 & 3 \end{pmatrix}$. Find all eigenvalues and bases of each eigenspace. Is A diagonalizable? 20
If so, find an invertible matrix P such that $P^{-1}AP$ is diagonal. Find eigenvalues and eigenvectors of A^7 and compute A^7 .